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Original Article

Hybrid model of dermatology residency training in COVID-19 pandemic

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Abstract

Objective To plan and execute a teaching and assessment strategy to engage the residents in academics to minimize the potential loss in their training during COVID-19 pandemic.

Methods At the start of COVID-19 pandemic in the country (from 4th week of March 2020), we started online academic activities for our 28 post graduate residents, by incorporating smart phone applications ("WhatsApp" and "Zoom") and during following one and half year, our teaching strategy evolved through following four stages. (i) Pure Online Learning, (ii) Online plus Physical Learning, (iii) Predominantly Physical Learning, (iv) Reengagement in a "new normal" environment..

Results All components of residency curriculum (theoretical knowledge, professional competencies, skills enhancement) were achieved through frequent MCQs tests, clinical slide sessions, patient-based real time teaching, case presentations, Mock viva and TOACS exams and hands on workshops.

Conclusion Hybrid model using smart phones with WhatsApp and Zoom applications is a feasible, cost-effective, and appropriate alternate to traditional medical education during COVID-19 pandemic.

Key words
COVID-19, SARS-COV-2, pandemic, Novel coronavirus, residency training, Online teaching. Online assessment. Pandemic pedagogy, Hybrid teaching, Blended learning, E-learning, Medical education, Developing countries.

Introduction

Hybrid learning (HL) refers to synchronous lessons that are taught live and remotely at the same time and students spend at least half of their time learning online and the rest of their time learning in physical classrooms.[1,2] Blended learning (BL) is a model that uses online learning to supplement in-class teaching, but it still focuses primarily on teachers and students being physically present for most of the teaching time.[3,4] Mostly both terms are used synonymously. In Pakistan, like other developing countries, most of the teaching was through traditional teaching methods using face-to-face only lessons that may or may not incorporate some technology.[4] In addition to resource constraint there seemed a psychological inertia in shifting towards more effective and dynamic ways of teaching. Pandemic has provided a catalyst for this transition and by compulsion institutions had to incorporate online content, instructions, digital media and social media into teaching and learning strategies.[5] Dermatology is a field of medicine in which hybrid learning model can be conveniently and effectively used as educational strategy.[4] This is because dermatology education is primarily

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based on good quality images, illustrations and multimedia features. Facebook, Some of the major platforms being used for collaborative learning, and knowledge sharing are WhatsApp, Zoom, YouTube, Google Classrooms and Instagram.[6,7]

Methods

Dermatology department PNS Shifa is an accredited institute for postgraduate training for last about three decades. At start of pandemic, there were four instructors, 28 full time post graduate residents and 8 post-graduate trainees on rotational training. During March 2020, residency training in dermatology was completely discontinued in the country due to 1st peak of coronavirus and all the trainees were staying at home. Since all the residents were familiar in using smart phones and internet, we decided to incorporate "WhatsApp" (one of the most commonly used application for instant messaging) to resume education in our department. We included only 28 full time post graduate residents in the study and started online academic activities in 4th week of March 2020. Our teaching strategy (Pandemic Pedagogy)[8] evolved through following four stages during subsequent one and half year.

(i) Pure online learning (March to July 2020)

During the first stage of complete/ almost complete lockdown, we adopted total online teaching. The methodology was to study at home the assigned topics which was followed by 2-3 weekly assessment in the form of multiple choice questions (MCQs) and short answer questions (SAQs). All the trainees and consultants were added in a WhatsApp group. Topics were selected from chapters in Rook's textbook of Dermatology 9th edition and related articles from Journal of American Academy of Dermatology (JAAD) and these topics were assigned to all the residents according to their level of residency. After preparing the topics thoroughly, they were asked to make 10 (MCQs) and 2 SAQs The residents were already primed and were possessing the basic required knowledge of developing MCQs and SAQs based on clinical scenarios. This academic activity involved higher order cognition in thorough comprehension of the subject and further cognitive involvement through development questions for assessment.[9,10] These tasks were evaluated first by the assigned instructor who improved and modified accordingly and subsequently these were validated collectively by faculty, focusing the concept, importance of content, difficulty and cognitive level of each question. All attempts were made to transform all the questions to be scenario based, context rich and problem solving type so as to test the moderate or higher cognition skills. Simple recall questions were eliminated. 30 -50% of questions were added by the instructors for each topic. Since "Assessment drive learning" therefore, we initially scheduled online tests for the assigned topics every alternate day **(Table 1)**. On scheduled time, microsoft (MS) Word file containing 2 SAQs and 10 MCQs were uploaded on the WhatsApp group. Residents were instructed to complete the test at 1 h time and to email their responses in next 5 minutes for marking. Penalty for each minute delay was imposed afterwards. After each test, results were shared in next few hours and feedback regarding difficulty level and quality of the assessment and was also collected.

(ii) Online plus physical learning (August to November 2020)

With partial resumption of clinical out door dermatology services in hospitals, we started engaging residents in patient-based real time learning and clinical skills learning in outdoor dermatology clinics after observing all personal

protective measures and social distancing related to COVID-19. We divided the residents in two equal groups. Group-1 attended the clinics with routine tutorials, lectures, journal clubs, and case presentations, while the group-2 stayed at home, doing self-study and attending all online/ zoom sessions. After 2 consecutive weeks both groups exchanged positions. Weekly clinical presentations, journal club and clinical slide sessions were also included in the training schedule. This cycle of hybrid learning was repeated till restart of academic activities in the third phase. To share learning with each other on a daily basis, we also made pairing of residents in which one resident from the group1 was paired with one resident of the group 2. This was monitored by the instructors. In addition, biweekly tests continued to cover knowledge and its application segment.

(iii) Predominantly physical learning (December 2020 to March 2021)

During this phase, we resumed predominantly in person residency training. More skill based and affective learning was introduced at the expense of a reduction of cognitive knowledge-based learning. Grand clinical rounds, work based clinical assessments were started. Hands on workshops to teach new clinical skills and Mock viva exams were conducted. Residents were continuously given tasks from their curriculum to prepare and they were tested once weekly through MCQs as previously.

(iv) Reengagement in a "new normal" environment (April to September 2021)

In this phase, we considerably reduced the online component and theory part of curriculum and introduced more components of affective and competency based learning like Hands on workshops, and Mock exam of TOACS.

Results

First Phase (Pure Online Learning)[8]

We were able to conduct 9 routine tests and one grand test (comprising all mini tests), subsequently we scheduled tests twice weekly and conducted 6 mini tests and one grand test during the last week. After 3 months of WhatsApp learning, we started incorporating zoom sessions for clinical case presentations and interactive classes on assigned topics thrice weekly and continued biweekly tests and monthly grand test as per timetable. By the end 1st phase (4 months) of learning from home, we covered approximately 30% of the curriculum that they would have learned during 9-10 routine months **(Table 1)**.

Second Phase (Online + Physical Learning)

We finished with covering almost 60% of curriculum during this phase **(Table 1)**. Moreover, we could partially resume patient-based real time learning, professional competency and skill enhancement that we were not able to do in previous four months and this was done with social distancing and observing other COVID-19 instructions for personal protection.

Third Phase (Predominantly Physical Learning)

During this phase, we resumed predominantly in person residency training (grand clinical rounds, work based clinical assessments, hands on workshops and Mock viva exams) at the expense of a reduction of cognitive knowledge-based learning. We could complete almost 75% of knowledge-based curriculum during this phase **(Table 1)**.

Table 1 Details of curriculum covered in various phases of Dermatology Residency during pandemic.

Period	*Curriculum covered*
1. Apr 20 - Jul 20	Morphoea, Rheumatoid Disease, Dermatomyositis, Systemic Lupus erythematosus, Antiphopholipid Antibody Syndrome, Systemic Sclerosis, Mixed Connective Tissue Disease, Syphilis and other Sexually Transmitted Infections, HIV, Kaposi's sarcoma, Basal Cell Carcinoma, Squamous cell carcinoma, Merkel cell carcinoma, Cutaneous Lymphomas, Fungal Infections, Emerging Infectious Diseases, Leprosy, Mycobacterial Infections, Bacterial Infection, Psoriasis and related disorders, Disorders of hypo and depigmentation, Purpura and vasculitic Disorders, Venous leg ulcers, Wound Healing, Porphyrias, Mucinosis, Amyloidosis, Xanthomas, Disorders of Calcification, Nutritional Disorders, Sarcoidosis, Severe cutaneous drug reactions, Systemic Drugs, Topical Drugs, Pregnancy Drugs, Chemo drugs, Phototherapy, Photodynamic therapy, Chemical Peeling, Radiotherapy, Cutaneous Lasers, Electrosurgery, , Skin Biopsy, Cutaneous surgery.
2. Aug 20 – Nov 20	Fungal Infections, Parasitic Infections, Skin diseases due to Arthropods, Viral Infections, Acute & Chronic Pain management Acquired Bullous disorders Pigmentary Disorders, Hereditary Bullous Disorders, Lichen Planus, Lichenoid Disorders, Pityriasis Rubra Pilaris, GVHD, Eczematous Disorders, Sebhorrhic Dermatitis, Atopic Dermatitis, Inherited disorders of Cornification, Inherited Acantholytic Disorders, Ectodermal Dysplasia, Ichthyoses, Palmoplanter Keratodermas, Urticaria, Angioedema, Urticarial Vasculitis, Auto-inflammatory diseases, Mastocytosis, Reactive Erythemas, Behcet's Disease, Neutrophilic Disorders, Onychodermatology, Genetic Defects of Nails and Nail Growth., Disorders of Cutaneous Vasculature and Adipose Tissue, Congenital Naevi, Genetic Disorders of Collagen, Elastin and dermal Matrix, Chromosomal Disorders, Poikiloderma Syndromes and DNA repair disorders.
3. Dec 20 – Mar 21	Syndromes with Premature Ageing and Hamartoneoplastic Syndromes, Inherited Metabolic Diseases and Inherited Immunodeficiency disorders, Mucocutaneous Pain Syndromes, Acne, Rosacea, Acquired Disorders of the Sebaceous and Sweat Glands, Hidradenitis Suppurativa, Pruritus, Prurigo, Lichen Simplex and Neurological Conditions of the Skin, Psychodermatology and Psychocutaneous Diseases, Disorders of Dermal Connective Tissue, Granulomatous Disorders, Panniculitis, Purpura, Retiform Purpura, Cutaneous Vasculitis, s, Scalp Dermatoses, Dermatoses of the Eye, Skin disorders of External Ear, , Dermatoses of the Oral Cavity and Lips, Disorders of the Veins and Arterie
4. Apr 21 – Sep 21	Disorders of the Lymphatic Vessels, Flushing and Blushing, Dermatoses of Perianal Skin Disoders, Skin manifestations of Stomas and Fistulae, Male and Female Genitalia, Pregnancy Disorders, Dermatoses of Neonates, Haemangiomas of Infancy, Benign and severe adverse skin reactions to drugs, Chemotherapy & Radiotherapy Skin Side Effects, Dermatoses by Illicit Drugs, Metal Poisoning and Cutaneous Manifestations, Mechanical Skin Injury, Pressure Ulcers, Pressure Injury, Cutaneous Reactions to Cold and Heat, Burns and Heat Injury, Cutaneous Histiocytosis Lymphocytic Infiltrates, , Occupational Dermatology, Dermoscopy Workshop, Presentations and Hands on, TOACS Mock exam, Photosensitivity Disorders, Allergic Contact Dermatitis, Irritant Contact Dermatitis, Stings and Bites, Benign Melanocytic Naevi, Benign Keratinocytic Proliferations , Cutaneous Cysts, Soft-tissue Tumours, Appendageal Tumours of Skin, Melanoma, Dermoscopy of Melanoma and Nevi, Skin Cancers in the Immunocompromised Patient, Cutaneous Markers of Malignancy, Disorders of the Haematopoietic and Immune Systems, The Skin and Endocrine Disorders, Heart Disorders, Disorders of respiratory system, Digestive System Disorders, Kidney and Urinary Tract Disorders and Disorders of the Musculoskeletal System, Skin Ageing, Cosmecuticals, Chemical Peels, Aesthetic Uses of Botulinum Toxins, Soft Tissue Augmentation, Lasers and Energy-based Devices.

Fourth Phase (reengagement in a "new normal" environment)

In this phase, we considerably reduced the online component and theory part of curriculum and introduced more components of affective and competency based learning (more hands on workshops, and mock exams) and moreover, we covered 100% of theory part of the curriculum.

Details of all academic activities covered during all phases are summarized **(Table 2)**.

Overall Outcome

During this transformation from conventional to

Table 2 Details of other curricular activities covered during COVID-19 pandemic.

No	*Academic activities*	*1st Phase*	*2nd Phase*	*3rd Phase*	*On going phase*
1	Grand round	N	N	Y/N	Y
2	Clinical presentations- Long cases	N	N/Y	Y/N	Y
3	Clinical presentations- Short cases	N	N/Y	Y/N	Y
4	Journal clubs	N	N/Y	Y	Y
5	Clinical slide session	N	N/Y	Y	Y
6	Histopathology slide session	N	N	Y/N	Y
7	Mini CEX	N	N	Y/N	Y
8	Work based assessments	N	N	Y/N	Y
9	Skill Demonstration	N	N/Y	Y	Y
10	Bed side teaching	N	N	Y/N	Y
11	Workshop/ Seminars	N	N	Y/N	Y
12	Mock Viva Exam	N	N	Y/N	Y
13	Mock Exam on TOACS	N	N	N	Y

N = No, Y = Yes, N/Y = predominantly No, Y/N = Predominantly Yes

virtual online and then to hybrid model of residency training, we came across many challenges, which we tried addressing appropriately **(Table 3)**. We were continuously modifying and incorporating available, feasible and economical tools of learning and assessment according to the prevalent scenario. Teaching and assessment strategies/tools adapted during this paradigm shift from conventional pedagogy to pandemic pedagogy are briefly described in **(Table 3)**. During this one and a half year we were continuously getting formal and informal feedback from our residents. This was helpful in making our strategy more objective and target orientated through incorporating all basic and advanced elements of postgraduate residential training in subject of dermatology.

Program highlights

1. We could engage residents in academics without losing their precious time.
2. Residents could cover the major portion of their curriculum covering knowledge, skill and attitude **(Table 1)**.
3. Significant improvement was observed in cognitive skills, psychomotor skills and professional attitude through context rich standardized assessments[9] (SAQs, MCQs, Mini CEX, WBA, TOACSs and MOCK exams).
4. Resident's empowerment[10] through active involvement in developing the questions, conducting the test, evaluating their peers, being mock patient and examiner and active engagement in mock exam activities.
5. The reflective feedback received from the residents revealed that the whole academic exercise during pandemic was fruitful for them. During 1st and 2nd phase they learnt mostly the knowledge and cognitive part but they could cover the deficient psychomotor and affective portion in 3rd and 4th phase of training. The experience of being examiner/ evaluator was found to be thrilling. Moreover, they also realized the challenges of being a good examiner and evaluator.
6. During this whole academic transformation, we did not require any extra logistical/ material or financial resources from the hospital administration. It was economically feasible for residents, faculty and the institution.
7. No technology-related barrier was faced as the residents were already familiar and comfortable with the use of smart phone, WhatsApp, email, and Zoom.
8. Residents' performance was assessed by the supervisors through periodic formative assessment that helped identify areas for improvement which were adequacy addressed by arranging special tutorials, workshops and mock exams.

Table 3 Challenges faced during COVID-19 pandemic and how these were addressed.

No	*Challenges*	*Addressed*
1	No teaching with lectures, seminars, team facilitated activities.	Self-directed learning during 1st & 2nd phase.
2	Limited in person teaching.	Zoom video communication during 1st & 2nd phase.
3	Limited clinical exposure.	Paper patients, Teledermatology during 1st & 2nd phase.
4	Limited practical/ surgical exposure.	Making short Skill videos and uploading for residents during 2nd & 3rd phase.
5	Limited Histopathology training.	Histopathology slide sessions online during 1st & 2nd phase.
6	Minimal chances for psychomotor and affective domain learning.	During 2nd and 3rd phase more time was allocated for these.
7	Almost no opportunity patient-based learning in real time.	During 2nd and 3rd phase residents in groups of 2 and 3 were made to attend patients with all protective SOPs
8	Procedural skills could not be taught through hands-on training.	More Hands on training were provided during 3rd and 4th phase.
9	Nil exposure to manage acute dermatological emergencies.	During 3rd and 4th phase, residents were placed on rotation basis to ICUs to manage such cases.
10	Lack of opportunity to explore in detail, newly emerging cutaneous manifestations related to COVID-19.	During 2nd, 3rd and 4th phase, residents were rotated to COVID-19 wards to observe, record and manage COVID-19 related cutaneous manifestations.
11	Testing knowledge without using higher level of cognition through a selected clinical topic during each assessment.	By improving content validity through higher cognition tasks and by conducting regular mini grand test every month and grand test every 3 month.
12	Any possible element of cheating/ dishonesty during online assessment.	By making every test time bound and applying penalty for late submission.
13	No opportunity to assess psychomotor and affective learning.	During 3rd and 4th phase, mini CXE, one minute perception, work based learning, MOCK exams and TOACKs were conducted.

9. It happened to be a great productive academic activity for the stakeholders. (for trainees as their learning effectively continued despite complete or partial lockdown for other major activities, for supervisors as accomplishment of their professional and ethical commitment by their continuous engagement, for institution by running this economical and feasible model of teaching and for/ licensing bodies for not having any discontinuation in training during this unprecedented pandemic that have affected almost every aspects of lives).
10. The most satisfying for us as dermatology faculty was the fact that we could cover entire portion of theoretical knowledge and cognition in just one and half year and now on this knowledge base we will have much more time to build psychomotor and affective skills in more effective way and will be able to produce more competent and professionally sound future dermatologists

Discussion

In medical education, hybrid/ blended learning has recently grown rapidly and has demonstrated better effects on knowledge outcomes during this COVID-19 pandemic.[2,3] Different modifications like teledermatology, virtual dermatology, video education, limited in-person approach, modelling patients and hybrid model approach have recently been introduced to counter the ongoing challenges of still unpredictable pandemic. These approaches may help residents to develop efficiency, resilience and self-efficacy.[11-14] We have tried transforming our pedagogy from traditional to hybrid model according to the need of the hour. We primarily used WhatsApp and Zoom, where

as other applications like twitter have also been used in pandemic pedagogy.[15] We believe many of our contemporaries involved in postgraduate training must have modified residency training during this ongoing pandemic and we would like them to share their experiences to learn from each's unique experience. We also look forward suggestions and critical opinions from our peers in this regard so that a better and more robust approach towards residency training of our post graduate trainees can be adopted in this transition phase of medical education that can go a long way. We are of the opinion, that limitations and few inherent disadvantages in our adopted model can easily be outweighed by a myriad of apparent advantages. Moreover, little modification and correction in applied pedagogy can appropriately address these intrinsic challenges and limitations.

Conclusion

With continuously emerging new viral variants, COVID-19 pandemic seems likely not ending in the near future, Hybrid model or blended learning and teaching is a feasible, cost-effective, and appropriate alternate to traditional education in medicine. Smart phones containing globally available free applications (WhatsApp and Zoom) can be used very effectively in cognitive skill enhancement, knowledge sharing, and as an assessment tool even in settings with constrained resources.

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